DOCUMENT RESUME

ED 439 460 CS 510 271

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TITLE	Directions in Distance Education.
INSTITUTION	National Communication Association, Annandale, VA.
PUB DATE	1996-00-00
NOTE	33p.
AVAILABLE FROM	For full text: http://www.natcom.org/ctronline2/95-96dir.htm.
PUB TYPE	Information Analyses (070)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Access to Education; *Computer Mediated Communication; *Distance Education; Higher Education; *Instructional Effectiveness; Interactive Television; Literature Reviews; Telecommunications

ABSTRACT

Noting that forms of distance education have been available for 150 years, this paper gives an overview of distance education designed to help educators understand how distance education can be used. Sections of the paper address: (1) background of distance education; (2) methods and technology for delivery of distance education (including computer-mediated communication and interactive video networks); (3) administrative concerns; (4) pros and cons of distance education; and (5) a summary of research regarding student learning. The most recent research suggests that the new technology has provided advances that enable students to learn as well with distance education as they might in traditional educational settings. Also, the advantages of distance education over traditional instruction include the opportunity to achieve equity of access, share resources, provide personnel when teachers are unavailable, extend existing personnel, provide special courses, adapt to individual learning styles, and improve flexibility regarding physical, time, and scheduling constraints. (Contains 78 references in which 25 items are distance education and computer-mediated related.) (RS)

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Directions in Distance Education.

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Directions in Distance Education

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Abstract: This article gives an overview of distance education designed for the purpose of helping the educator understand how distance education can be used. The authors give the background of distance education, methods and technology for delivery of distance education, administrative concerns, pros and cons of distance education, and a summary of research regarding student learning.

Forms of distance education have been available for 150 years. With recent computer technologies, however, the importance and effectiveness of distance education has grown significantly. Two model universities--Nova University in Florida and Open University in England--have placed major emphasis on distance education. Today, everything from college courses to complete degree programs are available through distance education.

Although 25 years ago some educators said that computers would revolutionize higher education, technology and delivery systems are now offering viable educational options. Computer mediated communication which uses distance computer networking offers instruction through such services as Internet and the World Wide Web. Interactive video networks are considered by some to be the most high-tech of the distance education methods. There are several types of interactive technology used today.

Many educators were critical of distance learning in early years because of the expense of technology, lack of student-teacher interaction, and questions over the quality of student learning. The most recent research, however, suggests that new technology has provided advances that enable students to learn as well with distance education as they might in traditional educational settings. Students and teachers can interact in new and crucial ways to facilitate learning. In fact, distance learning has advantages over traditional instructional methods by offering the opportunity to: achieve equity of access, share resources, provide personnel when teachers are unavailable, extend existing personnel, provide special courses, adapt to individual learning styles, and improve flexibility regarding physical, time, and scheduling.

Directions in Distance Education

Distance education is an emerging phenomenon which has shown exciting potential. Distance education involves a complex interaction of people, technology, systems, and

processes. As states have moved to set policy for distance education, a variety of models have emerged (Schrum, 1991). The term "distance education" according to Verduim and Clark (1991) may have first appeared in the 1892 catalogue of the University of Wisconsin. After being popularized in Germany, France, and England, it was probably reintroduced to the United States by Bjorn Holmberg and Michael Moore. This term--distance education--has been defined as any formal approach to education in which the majority of the instruction occurs while the educator and learner are at a distance from one another (Verduim & Clark, 1991, p. 8) with the interactive phase of teaching being conducted through print, mechanical and/or electronic means (Norenberg & Lundblad, 1987, p. 2).

Keegan (1990) defined distance education in a more detailed manner:

> the quasi-permanent separation of teacher and learner throughout the length of the learning process (this distinguishes it from conventional face-to-face education);
>
> the influence of an education organization both in the planning and preparation of learning materials and in the provision of student support services (this distinguishes it from private study and teach-yourself programs);
>
> the use of technical media--print, audio, video or computer--to unite teacher and learner and carry the content of the course;
>
> the provision of two-way communication so that the student may benefit from or even initiate dialog (this distinguishes it from other uses of technology in education); and
>
> the quasi-permanent absence of the learning group throughout the length of the learning process so that people are usually taught as individuals and not in groups, with the possibility of occasional meetings for both didactic and socialization purposes (p. 44).

In today's society, there are socio-economic changes being brought about by the emerging information age, the rapid changes in technology and communications, the emerging global economy and change in population demographics (Norenberg & Lundblad, 1987). Educators are challenged by the needs of an increasingly diverse student population in need of training, retraining, and updating of skills to acquire new jobs or to keep current in present occupations. In today's society; there is also the perception that convenient and quality educational opportunities should be made available to anyone who desires them. With the advance of technology, distance education is an alternative means of delivering quality instruction to those who desire it. In this article, we discuss: (a) some background of distance education, (b) the student of distance education programs, (c) the administrative prospective of a program, and (d) the technology involved. The terms distance education and

distance learning will be used interchangeably, although some scholars have distinguished between the two terms.

Background of Distance Education

For 150 years, correspondence education has been used to deliver instruction to students (Schrum, 1991). The materials for the courses were printed and mailed to the students in outlying areas which would return assignments via the same method. In 1840, England started the earliest distance tutoring courses by teaching shorthand. Since World War I, distance education spread rapidly and is in one form or another all over the world. As media and technology advanced, education incorporated media into distance education: newspapers, radio, television, telephones, satellite transmission, and electronic publishing. British Open University (BOU) and the University of Mid-America are examples of experimentation with new methods for instructional delivery (Cross, 1981) which emphasize the delivery of education through television, correspondence, and radio. This media-oriented university was a bold new venture of the early 1970s. The British Open University (BOU) was established in 1969, and by 1971, one third of the adult population of England had heard of it, and by 1975, more than half of Britons knew of its existence. Like most of the adult programs in the United States, BOU appeals primarily to upwardly mobile young adults who hold good jobs in professional and technical occupations but are far more likely than full-time college students to be from working-class backgrounds (Cross, 1981). According to Jenkins (1981), the British Open University designed the program where most of the student's time is spent studying texts alone at home. A typical credit course requires 360 hours of study. In an average course, support to learning is given by eight computer-graded assignments, four tutor-graded assignments, sixteen hours of instructional broadcasts (either television or radio), one week at summer school, together with regular optional seminars at regional study centers and weekly broadcasts on matters of general interest to students.

Millions of people have learned via distance education. According to Schrum (1991), in China almost 50 percent of postsecondary students use distance learning; in the Soviet Union, 30 percent; in East Germany, 25 percent. In the United States, distance education at the adult level originally was used in military, corporate, and university continuing education.

Since President Kennedy signed the Satellite Communications Act in the early 1960's--which launched the first satellites--people have been able to efficiently communicate at a distance. The major providers of distance education have benefited from these communication satellites that circle the globe. Over the last seven years, this situation has improved dramatically. Higher education has been diversifying, more people have become interested in postsecondary education, and societal pressures have forced institutions to offer a wide variety of course delivery options. Prior to 1987 (Norenberg & Lundblad), distance education in the United States was characterized by its pragmatic trial and error approach with little consideration being given to theoretical basis.

The Office of Technology Assessment (OTA) published a report, Linking for Learning: A New Course for Education, in 1989 which discussed the current status of distance education in the United States. According to this report virtually all states were involved in distance education at some level. The significance of states as the key players in distance education is because they have a legal responsibility to implement specific aspects of education. Further documentation of the National Governors' Association action document, Time for Results (1987), reported that the most prominent area of state involvement in 1987-88 was distance learning or telecommunications (Ely, 1988). The interest in this aspect of educational technology has been stimulated by concerns to improve equity because of shortages of qualified elementary and secondary school teachers. When rural or inner city district teachers are unavailable, the student's opportunity to learn is diminished. Through distance education, however, the lessons are brought to the student via educational television, satellite, cable, or microwave, thus enabling students the chance to take courses from highly skilled educators.

The National Technological University (NTU) has been bringing together technical professional and high tech industries (Marek, 1991). Through NTU, highly mobile engineers, scientists, and technical managers can study for their masters degrees while continuing to work full-time. One distinct aspect of NTU is that it is accredited and can award degrees, even though credit is earned at the university where the course is taught. NTU is not only an innovator with education, but also one of the first distance learning institutions to test video compression technology.

Mind Extension University (ME/U) is also a pioneer in distance learning (Marek, 1991). It was created in 1987 by Glenn Jones, founder of Jones Intercable, Inc. Today ME/U is available to 12 million television households and is on its way to becoming one of the most successful services offering higher education. ME/U was created to serve as a distribution channel for educational opportunities, combining the technologies and resources of cable and satellite television with the expertise of the finest educational and instructional facilities (ME/U pamphlet, 1992). The National Universities Degree Consortium Members for ME/U include: Colorado State University, Kansas State University, Oklahoma State University, University of Maryland University College, University of New Orleans, University of Oklahoma, University of South Carolina, Utah State University and Washington State University. According to Robichaux (1992), 21 universities offer credit for courses they transmit on the channel. Students can earn full-fledged degrees from University of Maryland, George Washington University and Colorado State. ME/U is a delivery system (Marek, 1991). According to C. Swickard, ME/U do not give credit; the institutions broadcasting the courses grant the credit (personal communication, October 7, 1992). ME/U takes care of registration, the admissions, the bookstore, and provides a tape service, similar to electronic class notes. There are a growing number of institutions that offer degrees via distance education, (e.g. The University of North Dakota, North Dakota State University, North Dakota State College of Science, Watkins, 1994). Nova University is probably the nation's leader in distance education at the college level, having begun development in 1983

(Mizell, 1991, 1993, 1994). Nova offers undergraduate and graduate degree programs in education, business and public administration, psychology, computer sciences (Hesser, 1993).

Texas Interactive Instructional Network (TI-IN), based in San Antonio and founded in 1985, was the first private long-distance television network to offer educational resources (Schrum, 1991). It offers live interactive satellite-delivered courses to high school students in forty states. In 1984, the Texas legislature required districts to offer any course requested by ten or more students. Satellite delivery of some courses was an acceptable alternative for small rural districts, and it now provides professional development activities to teachers, administrators, and staff. In addition, TI-IN has expanded the types of interactive responses by using push-button talk-back phones, electronic writing tablets, and electronic mail. According to Marek (1991), TI-IN claims to be the only for-profit distributor of satellite-delivered educational programming.

In April 1990, Mind Extension University teamed up with the TI-IN Network to provide its programming via satellite to school districts in 29 states (Marek, 1991). Because of this new partnership, TI-IN is able to expand its transmission capabilities to include millions of cable subscribers on ME/U--in addition to those with satellite dishes--making its programming cost effective and more accessible to schools.

Oklahoma State University is the home of another popular satellite network, Arts and Sciences Teleconferencing Service (ASTS) (Schrum, 1991). This network began offering enrichment programming in the early 1980s. Soon they developed and began offering German Language courses that were widely recognized as exceptional. One unique feature of this course was the inclusion of certified teacher partners on-site for remote students. These teachers use computer-assisted instructional software packages provided by the network as complementary class material.

Satellite Educational Resources Consortium (SERC) began as a partnership between state departments of education and state educational broadcasting networks in eighteen states (Schrum, 1991). Their focus is on science, math and foreign languages. The Distance Learning Teleconference at Johnson County Community College interviewed Paul Norton of SERC who stated they now work with 23 states. The programs are designed for students who wanted a particular course, but have no teacher available to teach. SERC also has an 800 number available--that is open 24 hours a day--to students who have questions (Distance Learning Teleconference, September 16, 1992).

A federal effort to support distance education has had a major impact on the growth and development of technological delivery in the United States (Schrum, 1991). An Omnibus Trade Bill and Competitiveness Act, passed by Congress in 1988, created the Star Schools Program (Star, 1991). This program was intended to address two critical needs in our educational systems: (a) meet domestic challenges, and (b) meet international challenges. The Star Schools Program focused on creating multistate, organizationally diverse

partnerships to write and deliver curriculum and create remote instruction opportunities for disadvantaged students (Schrum, 1991). The United States Department of Education has continued to develop this well-financed program with the goal of expanding and enhancing educational opportunities in rural, disadvantaged, and isolated areas (Newroe, 1991). The Star Schools Program uses a variety of technologies: live, interactive instruction via satellite, hands-on microcomputer programs and videodisc software.

One example of current developments in distance education is in the state of Kansas. The Kansas State Board of Education made a commitment to improving the quality of education for Kansas through the use of interactive television nearly five years ago (Kansas State Board of Education, 1992). Today, eight interactive television clusters are making the communication possibilities a reality. For those school districts, two-way interactive television provides an alternative to hiring more teachers, incurring travel costs and coping with a limited curriculum. Additional networks are being established and communication-lines expanded. Plans in varying districts include the community. Businesses are involved and they plan to have local law enforcement officials take part in training using the network. Dr. Lee Droegemueller, Kansas Commissioner of Education, says that communication is the first and most crucial steps in the lifelong learning process: "To keep pace with the world's changing priorities, citizens must be able to adapt to the demand for changing work skills. Communication is the vital link that binds these components of success" (Kansas State Board of Education, 1992, p. 19). Missouri is also working on establishing cluster groups in areas linked for interactive video through the Interactive Video Programming Task Force (Interactive Video Programming Task Force, 1992).

According to Brey (1991), the direction that distance learning in the United States is clear. The hundreds of local telecommunications networks and distance learning programs that already exist will continue to grow to the extent that most people in the United States will be served by at least one such program, and many people will be served by a number of distance learning programs. Brey predicts that the majority of local networks will be managed by two year institutions. The emerging statewide networks will be managed by upper level institutions and will offer baccalaureate and graduate degrees on a more wide-spread basis. Interstate and national networks will increase their offerings of everything from certification programs to doctoral degrees. Brey's study of distance learning programs revealed that community colleges are slightly more likely than universities to add well established technologies: cable, instructional television fixed service, microwave, and audio. Universities are more likely to add newer technologies: full motion satellite, very small aperture terminals (VSAT), and compressed video. The technologies preferred by community colleges are better able to serve metropolitan and small regional areas, while those preferred by universities are better at serving state and national markets.

Methods and Technology for Delivery of Distance Education

The method of distance education delivery is usually dependent on the cost of delivery and

the students receiving the instruction. One study suggests that no matter how distance education is delivered--low-tech, high-tech, interactive, or not interactive--students learn equally well (Russell, 1992). Although, outcomes on tests may show little difference in knowledge gained, adaptation to learning styles and attitudes toward learning do vary among individuals based on their learning mode. Other research has shown that higher levels of interaction resulted in higher levels of achievement (Kabat & Friedel, 1990). Adult learners tend to need less interaction to remain motivated and challenged to learn. With the age of electronic games and videos, the younger learners seem to learn more efficiently--at a higher rate of speed--using the high-tech interactive methods of teaching distance education. Learning styles have a large impact on the abilities of the learner to use different types of distance education technology. Sumser (1992) believes that kids are being hobbled by traditional teaching methods because youth are capable of processing larger quantities of data faster than their elders. Therefore, individuals need to use the learning method that best fits their learning style, whether it is high-tech, low-tech, or face-to-face (Janipeuh & Reeves, 1992).

Correspondence courses. Correspondence courses are the oldest and simplest form of distance education. Whether or not traditional correspondence courses are two-way communication is debatable, but students do have the opportunity to write or call the instructor. One would expect this form of distance education to continue, at least until the more high-tech methods of distance education are as easily obtained as correspondence courses.

Computer mediated communication (CMC). CMC involves using a computer to send course materials, tests, lecture notes, and messages to individuals. This technology uses the current telephone systems to connect computers together via a network or individual modem. Computer conferencing, electronic mail, and electronic bulletin boards are part of this approach (Wells, 1992). The network can be computers that are linked, whether they are in one room, one building, between buildings, between campuses, or accessible via modems all over the world. One major advantage to this approach is the ability to link colleges, such as is accomplished through the Embry-Riddle University and Nova University cooperative programs (Mizell, 1994). New technology is at the point of providing real alternatives for distance learning all over the world, and computer mediated communication in distance education is finding widespread adoption (e.g., Burge, 1990; Gregor & Cuskelly, 1994; Rossman, 1992). Internet and Bitnet are two international networks that connect thousands of individuals from primary/secondary schools, colleges/universities, research institutions, military organizations, and commercial organizations. These networks can be used for two-way communication between individuals around the world. Two-way communication is accomplished either via E-mail (like sending a letter then waiting for a reply) or by interactive "talk" in real-time (words are displayed on the screen as the person types). When used in conjunction with video or interactive video, CMC adds a two-way communication option that can be used when the class is not in session. This two-way ability allows discussions to continue between students and between students and teacher when class is not in session. One of the greatest advantages of networks like Internet and Bitnet is the ability

to access thousands of databases on hundreds of topics from around the world (Courtois, 1994; Fraase, 1993; Kahn, 1992; Morgan, 1994). The variety of information management tools available are making use easier for teachers (Collins, 1994). The World Wide Web is a system with amazing potential for education, in that it can allow students to access a wide variety of materials via computer (Barry, 1994; Berners, 1992; Descy, 1994; Gabbard, 1994; Morgan, 1994; Wiggins, 1995). A server on the campus, for example, can provide all course materials--e.g., verbal and visual instructional material, assignments, testing--directly to students all over the world.

Because computer mediated communication involves computers and telephone connections, the technology can cause some problems. Students and teachers need to learn how to use computers and the communication software needed to connect with other computers. Although most telephone systems provide good quality connections, some systems located in remote areas have poor quality lines causing problems with CMC (Gunawardena, 1992, p. 21). In addition, problems arise in the United States when rural switch boards will not respond to modems (Holloway, 1992, p. 17). Differences between computers can also cause problems, as different equipment has different capabilities and operating speeds.

CMC can be costly to an individual if the student does not have a computer capable of remote communication using a modem. Comparable to college book prices, for example, a typical instructional computer disc (CD) costs around $50. Most institutions have public domain (free) communication software available for student use but few provide computers for students to use at home. Some universities are arranging for low cost computer purchase agreements for their distance education students or in some cases institutions are renting computers to students who enroll in distance education classes. Additional costs may include the need to make a toll call when accessing a mainframe to upload or down load lesson assignments or to send or receive messages. Some institutions are providing toll free lines to distance education students (Rogers, 1992, p. 11) so students can connect to the mainframe. On-line time can be reduced by uploading and down loading information only when necessary; this will reduce on-line costs (Loney, 1992, p. 25; Rubin, 1992, p. 41). Student who use existing telephone lines for data transfer to and from the mainframe usually cannot afford to have more than one line into a house (Loney, 1992, p. 25). The dual use of telephone lines can cause problems if there is a need to communicate using the telephone while the computer is connected to the outside world via the same line.

Even with the problems and expenses mentioned above, CMC is one of the least costly methods of distance education delivery. Costs are low for the institution because mainframe computers and network connections are usually in place and being used for purposes other than distance education. Students wanting to use CMC can usually find a way to obtain a computer and the necessary additional hardware and software. According to Mason (1992), "CMC often works best where the need is strongest either through real isolation and desire to communicate, or through real motivation to access education."

Interactive Video Network (IVN). IVNs are the most high-tech of the distance education

methods. There are several types of technology used, the degree of interactivity and quality of video dictate the cost of the individual types. The majority or the networks in use are of the following type:

1. Analog Fiber. This method is a fiber optic cable network capable of full motion video (similar to home TV) and two-way video and audio. These networks are capable of having both the video and audio transmitted on the same cable. Four channels (individual pictures on four monitors from four locations) can be transmitted at the same time. Analog fiber networks need a large band width to operate (requiring a large amount of the cable's capacity); therefore, these networks are the most expensive to operate and install. The cost is high because of the high cable leasing fees charged by local telephone companies or the high cost of installing dedicated fiber optic cable. In many areas, especially rural areas, fiber cable is not available and must be installed.

2. Digital Fiber. This is a fiber optic cable network capable of full motion video (similar to home television) and two-way video and audio. These networks are capable of having both the video and audio transmitted on the same cable. As with analog fiber four channels (individual pictures on four monitors from four locations) can be transmitted at the same time. Digital fiber networks use a video coding technology so that there is less bandwidth necessary for transmission. This lowered bandwidth allows for a lower line lease cost from telephone companies. However, there is one drawback, digital fiber technology requires a expensive codec (a coder/decoder) at the sending and receiving ends of the network in addition to other hardware for the network. As mentioned above many areas, especially rural areas, fiber cable is not available.

3. T-1 Compressed. This method is a copper telephone cable network. This technology is not capable of full motion video (fast movement is somewhat blurred) but is capable of two-way video and audio. These networks are capable of having both the video and audio transmitted on the same cable. T-1 networks can transmit four pictures as mention above but the pictures will be on one monitor divided into four sections. T-1 compressed networks use a video coding technology so that there is less bandwidth necessary for transmission. This lowered bandwidth allows for a lower line lease cost from telephone companies. There is one drawback; T-1 compressed technology requires expensive codecs and other hardware for the network as mentioned above for digital fiber networks. The main advantage to T-1 compressed technology is that most telephone companies use the copper wire needed for the network transmissions. There is no need to install expensive cables.

4. Microwave. This technology uses microwave towers spaced approximately every 30 miles to transmit the video and audio signal. This method has the same capabilities as those of the fiber optic networks but the systems are expensive to install and operate. Many commercial microwave networks are being replaced by newer technology. This upgrade by commercial carriers has made available inexpensive microwave networks. For this reason many schools and universities are using microwave technology because of its relative low up front cost and two-way interactive video and audio capabilities (Kabat & Friedel, 1990).

5. Low-Power Television (LPTV). This network is just as its name implies, low power television transmission. These systems are capable of being received on regular TV sets. There is no two-way video and the two-way audio must be arranged using the telephone system. The biggest disadvantage is the lack of interactive video. The biggest advantage is that these networks are relative inexpensive.

6. Satellite. This type of network technology provides full motion video and two-way audio but no two-way video. Two-way video can be accomplished but requires satellite uplinks at each site which would be expensive and is out of the question for most educational institutions. Except for the lack of two-way video, this method of distance education delivery is the best buy because of the low hardware cost.

Other distance education delivery methods. Teleconferencing has been used for distance education mainly in office or industrial situations and for short course or seminar type instruction. For example, Athabasca University in Alberta combines computer-assisted instruction with computer conferencing in distance education (Morrison & Lauzon, 1992). Computer bulletin board services (BBS) have been used as a means of distributing class material similar to CMC. This method of distance education instruction is relatively simple and inexpensive but lacks interactivity. In some distance education courses telephone recorders have been used to store and relay class materials. Audio cassette tapes sent to individuals for self recording have also been used to gather data (Lockwood, 1989).

High-tech Distance Education Networks Proposed and in Use

Interactive remote teaching network (IRTN). An IRTN has been recommended to Longview Community College (Taylor et al., 1992). This network uses a new system by Fox Systems, Inc. to combine interactive video/audio supplied by microwave and computer graphics. This system uses the newest technology to integrate computers into interactive video/audio. This system when in place will provide valuable method for teaching computer aided drafting and other computer engineering courses to remote sites.

The Corporate Educational Network (CENET). CENET is being used to present a Managerial Accounting course to IBM Corp. employees (McKell, Hardy, & Stocks, 1992). This system allows one-way video and two-way audio on demand. If a student wants to ask a question, a question button is pressed at the student response unit (SRU) so that the instructor is alerted that a question is raised. The instructor from a monitor at the podium is then able to know who is asking the question and can turn the student's microphone on for the question. The SRU is equipped with an additional five button for response to multiple choice question.

The Agricultural Satellite Corporation (AG*SAT). AG*SAT in the first year funding (1989) was provided for five uplinks and 26 downlinks. After only three year of phenomenal growth and use, AG*SAT by the end of 1993 had 11 uplinks and over 1,100 down links

nation wide (Bretz, 1992; Marek, 1991). This satellite network is providing agricultural extension classes to rural area on pesticide use, live stock production, emergency procedures during droughts, and many other agriculture and rural living related topics. Most classes originate at schools of agriculture at land grant institutions across the United States.

CMC in developing countries. There are several CMC networks starting in or involving developing countries. These networks include the University of the Virgin Islands, AUSEAnet, CRAT/ARCT in Senegal, SDN in Korea, and Sulawesi Regional Development Project (Mason, 1992, p. 3).

Kansas City Educational Network (KC-EdNet). KC-EdNet, at the University of Missouri--KC, is an educational video hub (T. Brenneman, personal communication, September 17, 1992). Brenneman sees the network as a way to provide college level classes to a larger number of student in a time when funding cuts cause a shortage of professors. Also, Brenneman believes that the network can allow professors to team teach (professors take turns teaching a class) a class, thus allowing more time for research.

KC-EdNet is capable of integrating several audio/video systems including: microwave, uplink and downlink satellite, fiber optic, T-1, and regular cable TV. The network "sends live instruction to 18 remote sites located at campuses and corporate facilities in St. Louis, St. Joseph, and Kansas City" (Taylor et al., 1992, p. 7). Masters programs in computer science, pharmacy, nursing, electrical engineering, and mechanical engineering offered using KC-EdNet. Some of the courses originate at University of Missouri--Kansas City, and others at University of Missouri--Rolla, Kansas University, and Kansas State. The UMKC school of Education offers graduate courses in Higher Educational Administration using the technology in place at KC-EdNet. The classes are transmitted via microwave to Missouri Western College in St. Joseph (D. Mocker, personal conversation, November 10, 1992).

Proposed Missouri Interactive Television Network (MITVN). In December of 1989 the idea of a Interactive Television Network (ITV) for Missouri High Schools was begun. The purpose of the network is to provide low demand courses to several schools via an ITV network. Without the network low demand courses would not be offered to students in rural schools. According to M. Hanna, superintendent of Pleasant Hill school district, (personal communication, November 5, 1992) Hanna and two others were discussing the possibility of the network. Later when Hanna found that Sprint had installed fiber optic cable next to Pleasant Hill school for a nearby radar facility, Hanna started the push to interest other superintendents in the possibility of a statewide ITV network. After several years and many meetings with state and local school boards and telephone companies a plan for three clusters of schools to have ITV has been started. According to V. Hobbs, educational consultant from Mid-continent Regional Educational Laboratory, (personal communication, November 19, 1992) each cluster is made up of 5-6 high schools plus one university of college. Hobbs completed evaluations of networks already in place in Kansas and Minnesota and found that the ITV network works well and there is no need for a test project. Hobbs has tried to increase the affordability of the project by negotiating with telephone carriers for

lower rates and acquiring funding from the state. The Missouri Public Service Commission assigned a task force to make recommendation on the ITV network (Interactive Video Programming Task Force, 1992). The task force has suggested that in addition to providing high school courses the network should be used to provide health care and other training to rural Missouri residents.

Two of the clusters are expected to use the T-1 compressed technology. The schools in these clusters are not close together and do not all have access to fiber optic cable. The other cluster is expected to use analog fiber optic technology. This seemed to be most economical because these schools are closer together and fiber optic cable is available and close to most of the schools. Missouri's system is expected to be "teacher directed" the teacher will have the capability of switching cameras, microphones, slide projectors, and other equipment. The system will offer full interactive audio and video.

Administrative Concerns

Distance education programs have increasingly come to be viewed as complex systems with a variety of organizational, administrative, instructional, and technological components (Harrison et al., 1991). With conventional classroom education there is relatively little administrative support required (Norenberg & Lundblad, 1987). The administration needs to be concerned with problems with scheduling and management of staff within an institution. With distance education, however, there is a need for more administrative support. Administration must pay attention to production, distribution, technical considerations, administrative duties may be shared with other administrators, and liaison activities. Without the total support of top administrators, distance education will not become a reality at an institution or school district (M. Hanna, personal communication, November 5, 1992; D Mocker, Dean of School of Education, UMKC, personal communication, November 10, 1992).

Because of the potential accessibility to distance education, composition and nature of the student population may be quite different from the traditional homogeneous student populations that characterize much of conventional education (Norenberg & Lundblad, 1987). Distance learners may differ in two important ways. First, distance education will provide opportunities for people who now desire education but have difficulties in going to a learning institution. Thus, distance education will be very appealing to the adult population. Secondly, much of the control of the instruction and the responsibility for the learning outcomes reside with the students, not with the instructor. The instructor becomes more of a facilitator rather than a lecturer. Depending on the technology employed, the instructor's role is to design instruction and activities that aid the independent learner. The role of the instructor changes most significantly as distance teaching necessitates greater flexibility and cooperation with others in a more learner-centered environment. The distance education instructor must pay closer attention to the delivery system and to detail. Learning materials for distance education will need to be consciously and systematically designed, keeping in mind the characteristics of the delivery system to be used, the characteristics of

the learners or target groups, and the nature of the course. The materials should build on the strength of the various media, allow for a multi-media approach when necessary, and carefully match the materials to the technology being used by the students. The elements of good distance education include all the elements of good conventional teaching as well as good delivery includes clarity, adaptation to the learner's experience, education levels and needs, relevancy, learner involvement, specialized feedback, application of information, and speedy assessments.

One important aspect of the distance education for an administrator to understand is the key methods:

1. Instructional Television refers to the viewing of televised programming in the classroom usually via videotape or cable TV (Hobbs, Pellant, & Chastain, 1991). The Learning Channel is one example of this type of learning which can enhance the classroom experience. It is, of course, not interactive. Students see the videotaped or cable programming in the one-way reception of video.

2. Instruction by satellite enables the reception of classes from a distant source, which at the best enables only one-way video and intermittent two-way audio. This means that a student from anywhere in the country can see and hear her or his distant instructor, but at best is only able to talk to the instructor intermittently over separate telephone lines. The instructor, does not have the ability to see any of the students concurrently taking the course.

3. Two-Way Interactive Television refers to the ability to receive two-way audio and two-way video in the provision of stand-alone courses from a teacher located at one school with students located at one to three other sites (Hobbs, Pellant, & Chastain, 1991). While some teachers of distance education courses perceive a reduced student-teacher interaction as a main disadvantage (Rezabejm 1992), networks can arrange for solid interaction. A network may include up to sixteen different schools or receive/send sites, it is typical that only four sites be involved in any one course at any one time. This makes interaction between the teacher and all the students feasible and manageable. Audio and video signals are transmitted back and forth so that all participants (teacher and students at all sites) see, hear, and converse with one another as instruction takes place (Kansas State Department of Education, 1989). The key concept in an interactive video classroom system is maximum interactivity.

4. Fiber-optic cable contains hollow glass threads no thicker than a human hair (Kansas State Department of Education, 1989). Through these hollow glass tubes light pulses are beamed. Fiber-optic cable produces a clear picture which is unaffected by weather, and is less subject to noise and interference than copper cable. Fiber can transmit all signals including telephone calls, data transmission, facsimile, graphics, animation, compressed television, full motion television, and high definition television. Fiber is cost effective because it is buried underground, has low maintenance, and permits consolidation of all information delivery into one transmission medium.

With fiber optics, the first contact point outside the school usually becomes the local telephone company, but several obstacles may exist. The local telephone company may not be knowledgeable about the technology, fiber optic cable may not available or planned in a given area, or the telephone company may not be able to offer the service at competitive rates. Each of these problems are compounded when several schools working together to implement an Interactive network cross multiple telephone company boundaries. This has been one of the many difficulties with the Missouri Interactive Plan according to Vicki Hobbs (personal communication, November 19, 1992).

Schools, colleges and universities are not the only ones who can value from an interactive television network. In many of the smaller rural communities access to training and retraining is severely limited (Kansas State Department of Education, 1989). Access to training could be greatly enhanced with two-way fiber-optic communications. Just a few of the areas in which professional development is necessary include: police and fire departments, health care personnel, as well as school personnel. Businesses will also benefit as they can provide new product demonstrations, training on how to use new products, and basic retail customer support could be provided to every community in the cluster by businesses located in any one of the communities. Business seminars on marketing programs, investment and tax strategies, as well as agriculture extension courses could be delivered in each community.

Barriers

Once teachers are comfortable with the emerging technologies, many uses are possible (Schrum, 1991). The technologies provide unique opportunities to meet educational goals, enhance personal and professional development, and diminish teacher isolation. All levels of education from the university to the elementary school can now be electronically linked to each other and to information learning institutions such as museums and public libraries. Teachers can arrange for their students to interact with classes around the world, investigate remote sources of information and facilitate the process of democratization as groups exchange information equally. Students learn to recognize the similarities among all citizens and to celebrate each culture's unique aspects.

According to Hanrahan (1990), there are many barriers to the adoption of distance education and other media-based instructional methods in higher education. Two of the most persistent barriers are strategic planning and faculty resistance. Poor planning and administration can have a devastating effect on these programs. Concerning the issue of faculty resistance, college faculty may believe any number of myths and misconceptions about television teaching, including: the courses are not as rigorous; the quality is generally poor; instructional television is ineffective; or telecourse students lack direct faculty-student contact and therefore the motivation to work hard in the course. In addition to these, some faculty resist off-campus learning and others lack tolerance for students whose life situation does not permit them to attend college in a traditional way (Hanrahan, 1990).

In planning for distance education, the issue of rewards and incentives must have attention. Faculty have been concerned with how telecourses would be treated with regard to teaching load, paychecks and credit toward tenure and promotion (Hanrahan, 1990). According to D. Mocker (personal communication, November 19, 1992), faculty are also concerned with having their class sessions video-taped. According to Hanrahan (1990), the time spent developing a telecourse has not counted toward tenure or promotion, and as for academic credibility, the telecourse faculty are not highly regarded among their peers.

Student Research

Just as distance education is a non-traditional method of learning, the students who are involved in distance learning tend to be non-traditional students. The British Open University (BOU) began in 1971 to address the educational needs of a segment of the population that had no access to a higher education by offering courses through a distance learning program. These included persons who were severely disabled, long-term prisoners, and students who were often out of country for periods of time - such as the military and merchant seaman (Perry, 1977, p. 169). The BOU also hoped to present courses that would appeal to the manual laborer. While, more working class laborers were enrolled in the BOU than were studying at all the other British universities combined, there were fewer than was originally projected. During the first five months of operation, the drop-out rate was 25 percent and it was mainly in mathematics and science classes (Perry, 1977, p. 25). The BOU was obviously meeting a need since for the original 25,000 places; there was 43,000 applications (Eurich & Schwenkmeyer, 1971, p. 24).

In 1976, BOU began to offer continuing education courses. By 1989, there were more continuing education students in the program than undergraduates (Shane, 1989, p. 26). Perry now believes that continuing education is the most important part of BOU and that the future lies in electronic education for the retraining of employees in the trade and professional occupations (Shane, 1989, p. 27).

Perry (1977) was aware of some of the problems facing students who signed up for classes at BOU. The students had to plan their lives around school: broadcast time, writing of papers, assignments, reading and studying the material and spending one week a year on campus (Perry, 1977, p. 167). Most students also had a full time job and families. Any problems with a change in work schedule or a complication caused by the computer error at registration could be almost insurmountable (Perry, 1977, p. 168).

Educational Value

Cross (1981) compared the students in the distance learning program at the BOU and the students at the University of Mid-America (UMA). The students at BOU were mainly upwardly mobile young adults working in the professional and technical occupations and from a working-class background (p. 75). The students at UMA were also from a

middle-class background and half of them had previous college experiences (Cross, 1981, p. 76). Studies that had looked at the trends in enrollment showed that people who enroll in UMA tended to be older, have less formal education and are more likely to live on a farm or ranch than students at a more traditional school (Cross, 1981, p. 77). As the programs developed and matured, they continued to analysis their courses and delivery system to provide more opportunities for a segment of the population who had few options in higher education (Cross, 1981, p. 77).

Community colleges play a special role in distance education because they tend to have a mission to serve the non-traditional student. Hisel (1990) reported that in a survey of eight thousand students enrolled in forty-two different telecourses, 44 percent were over the age of twenty-nine, 68 percent were women, 81 percent were employed and most had dependents at home (p. 47). He also found most students were simultaneously enrolled in campus classes and were taking the telecourses at home because of scheduling problems (Hisel, 1990, p. 47).

Distance learning is now being used for some high schools. It allows students in small rural school district to have access to courses that would normally be available only at larger schools. These include higher level mathematics, science classes, and the less popular foreign languages.

In a study done in 1989, Hobbs looked at high school students enrolled in a German course by satellite from Oklahoma State University which was offered to high school students in North Dakota and Missouri. Students who succeeded in these courses tended to have the same characteristics that adult education generally required (Hobbs, 1990, p. 7). The students believed that they succeeded because they took responsibility for their own learning, had a willingness to work on their own, and had a high level of motivation (Hobbs, 1990, p. 10). The vast majority of the students (95 percent) planned to enroll in college. This type of learning seemed to appeal to student who worked well alone and seemed to prefer little association with fellow classmates or the teacher (Hobbs, 1990, p. 12).

The number of students who dropped out of the distance learning classes was not significantly different from that of a traditional class (Hobbs, 1990, p. 13). None of the students reported dropping because of conflict with the teacher or supervisor. They said that they did not feel frustrated by not having a teacher physically present in the classroom. Not getting an immediate answer to their questions was not seen as a major problem (Hobbs, 1990, p. 36). There did not appear to be any significant differences between students taught in the traditional method and those taught by distance learning technology (p. 47).

The University of Minnesota began a pilot program in 1991 using compressed video technology to link the campus in Minneapolis and St. Paul and the campus at Morris (150 miles away). Non credit courses and continuing education programs were offered. A five item questionnaire was given to 276 participates with 260 responding (Kolomeychuk, 1992, p. 61). The questionnaire evaluated whether they found this method of presenting extension

courses acceptable.

The participants reported that if the technical problems could be worked out, this type of learning would be acceptable (Kolomeychuk, 1992, p. 62). The students believed that they had increased access to experts, decreased travel time and cost, reached more people, had access to timely information, were able to interact with experts and peers, and had a more variable group size (Kolomeychuk, 1992, p. 62). The participates also saw some disadvantages with the program. These included technical problems (especially audio), lack of personal interaction between the sites, lack of informality in meetings and an increase in the stress on participates to take an active part (Kolomeychuk, 1992, p. 62). They found the studio classroom uncomfortable and the monitors used for the incoming signal too small (Kolomeychuk, 1992, p. 62).

Another study done at a large midwestern university compared the student grades between students who took an interactive computer/videodisc learning approach for learning biology concepts and science process skills to the grades of those students who took the conventional laboratory approach (Leonard, 1992, p. 94). The results showed that there was no statistically significant differences between the two groups on the grades on laboratory quizzes, laboratory reports and the laboratory final grade (Leonard, 1992, p. 93). The main difference between the two groups seemed to be in the time spent. The interactive videodisc group required approximately one-half the classroom time of the other group (Leonard, 1992, p. 94). Leonard (1992) cautioned that this could be just the result of the elimination of time spent waiting or doing the busywork normally required by the conventional laboratory setting (p. 100).

Holmberg (1989) suggests that methods of distance education are appropriate in fields of study that require a demonstration of process, such as surgery, engineering and chemistry. Video recordings can be repeated and clarified by the use of freeze-frame until the student is satisfied that the material has been learned (Holmberg, 1989, p. 129).

Chen and Noble (1992) looked at a group of youth leaders who took a course in substance abuse to determine if learning and retention from satellite delivery of the material was the same as classroom delivery. Results showed that distance education methods were equal to traditional forms of learning. There did not appear to be any significant statistical difference in the retention of the material between the two groups (Chen & Noble, 1992).

Results from studies done on student achievement in distance education for foreign language courses are difficult to interpret. This is due to the small sample size and the non-random selection of students (Clifford, 1990). One study of students studying the Japanese language showed that there was no significant difference between the achievement of students in the classroom and those taking a televised course (Clifford, 1990). In another study, students who were enrolled in a telecourse in German for two semesters did not achieve the same proficiency as those in a traditional classroom (Clifford, 1990).

Kabat and Friedel (1990) did a study on students involved in the Two-Way Interactive Distance Learning System (TIE) at Eastern Iowa Community College District. The TIE system links three Iowa community colleges with local public and private universities via a two-way microwave connections. This allowed for the production and transmittal of video and audio signals from the interactive television classroom to the remote-site electronic classroom (Kabat & Friedel, 1990, p. 2). The goal of TIE is to increase the diversity of courses available and to make quality offerings more accessible to students.

Kabat & Friedel (1990) showed that students learned by televised instruction and that the students prefer a system where they is audio talkback (p. 4). They also showed that students prefer live instruction to televised.

The purpose of distance education is to provide an opportunity for students who do not have access to the more traditional sources. The students could have problems of distance, time or financial restraints. Distance learning also is a way for small rural school districts to provide the opportunities for their students who want to go on to higher education and who need courses not wanted by many other students.

Clifford believes that distance learning should have as it's guiding principle not to "become permanent, but to serve as a stepping stone to hiring a regular classroom instructor by laying the basis for a viable language program especially in the less commonly taught languages" (Clifford, 1990).

Becker (1992) believes that studies have shown that learning is faster and retention better when television and computers are used for certain subjects instead of large classes and lectures (p. 92). Students are able to learn at their own speed and can repeat any portion of the instruction if they want to do so.

Special Issues

One of the issues in distance learning is the question of how much and what kind of student support is necessary. High school students taking distance learning course should have all the support services necessary made available by the school. Unfortunately, this is not the case for the higher education distance learner.

The Learning Resource Center (LRC) has a special role to play in distance education. They provide the support services for the faculty and students. These include books, indexes, periodical articles, reference assistance, audiovisual programs, software, microcomputers, audiovisual equipment, and study space (Hisel, 1990, p. 47). Hisel (1990) pointed out that accrediting commissions now expect colleges to provide comparable support systems to students in distance education courses (p. 47). Off-site students should be aware in advance of what services will be available to them. Hisel (1990) suggested that in some circumstances it would be more feasible for the school to contract with a nonaffiliated library to provide the resources and services needed (p. 48).

The LRC needs to be involved from the beginning in a distance education program. The staff needs to be familiar with the courses and with the methods used for their delivery.

Holmberg (1989) believes that where a good library facility is available a study guide should be used for distance learners instead of a self-contained course (p. 131). The study guide would allow the students to read and/or listen to presentations of various kinds. They could then compare, contrast, criticize, and come to their own conclusions.

Meadows (1992) addressed the issue of student support systems as part of the Bangkok Project on the Distance Education Online Symposium (DEOS). Meadows holds that the student support system has to be developed from the point of view of the student and not that of the institution. Different cultures require different services for the student. Even in regards to dropout rates that are acceptable, there is a difference between cultures. Some cultures will accept only a very low percentage of dropouts while other cultures do not have a problem with a much higher level of dropout. Course material will travel from culture to culture, but student support systems do not.

Student services should be provided according to the needs of the student. They should be dependent on the educational ethos of the region and the institution. Meadows (1992) also stressed the importance of student services being dependent on the "...dispersal of the student body, elements of resource and the curriculum or product of the course production sub-system." Student support staff also should be aware of the generic differences in the student body which the system has to serve. Because distance education serves all types of students from many different cultures, Meadows (1992) advocated that student support systems should vary greatly from institution to institution.

As part of the Bangkok Project on DEOS, Anderson (1992) also addressed the issue of student support. He saw the role of the student support system as an attempt to "translate the course production in accordance with cultural and socio-economic factors as well as factors of geography and the possibilities of the limitations of various different types of communication in the locality of the student" (Anderson, 1992). Individualizing the academic product to the student should be the main purpose of the student support staff. Many students see the role of the support system as that of a mediator. Anderson (1992) sees the future role for student support systems, especially that of mediator for the student, as the challenge for distance education in the future.

According to Bates (1990), some quality technology-based education projects failed because they failed to look at the high cost of operating the system and failed to consider the problems of adapting to local conditions (e.g., the lack of skilled personnel to operate the technologies) (p. 4). Bates (1990) reported on the growing recognition of the importance of adequate local and interpersonal student support (p. 5). Each program has to decide about local study centers and what will be the policy regarding the extent to which students would be required to attend local centers (Bates, 1990, p. 5).

If students using distance education apply for financial aid, one problem they may encounter is whether the program will still allow them to be a full-time student or will consider them a part-time student. Under the new Financial Aid Reauthorization Act passed in 1992, a school cannot offer more than 65 percent of its classes by distance learning in order for the student to be eligible to receive financial aid.

Keegan (1986) sees one of the weaknesses of distance education as the opinion that distance education is viewed as a non-traditional form of education. As a result, the degrees, diplomas, and qualifications achieved may not be accorded full academic acceptance (p. 116). This opinion should change as more and more research shows distance and computer course to be comparable to traditional courses (e.g. Goodwin, 1993).

Janipeuh & Reeves (1992) believe one of the major issues in interactive learning is that the equipment needs to be appropriate for the learner who will be using it (p. 40). Students should have to demonstrate that they know how to use a system in ways that will support their learning. Janipeuh & Reeves think this is one of the reasons there may not be a significant improvement in education when using an interactive learning system. Students become frustrated and confused when they are not comfortable with the technology and cannot take full advantage of the opportunities offered by the program.

To have a successful distance education program, you have to be aware of who the students are, what they already know, and their learning styles (Tanzillo, 1992, p. 47). The teacher also has to consider the style, the communication capacity, and the skills of the instructor. The nature of the message, its information intensiveness, and the learning objective are also important factors to consider (Tanzillo, 1992, p. 47).

All of the definitions of distance education include the element of the separation of the teacher from the learner. This separation of the teaching acts and the learning acts does not bring the distance learner into the student life of the institution. This lack of integration into the life of the institution has been linked to student dropout rates (Keegan, 1986, p. 113). Keegan saw this lack of interpersonal communication between the teacher and student as one of the weakness of distance education (Keegan, 1986, p. 114).

Distance learning has much to offer education today. It can be a cost effective method of giving access to opportunities to many people who might not otherwise have the chance. It does not appear that distance education techniques can replace the teacher in the classroom. While, most studies show students can learn as well by interactive technology as they can in the classroom, there does not seem to be an indication that they will learn better. When Hobbs (personal communication, November 19, 1992) was questioned on whether or not, all things being equal, she believed that interactive distance learning was better than the more traditional method, Hobbs said "no."

The ideal class size will vary depending on whether it is a high school class or a higher

education class. Mocker (personal communication, November 10, 1992) likes to have at least 15-20 students in each class site at UMKC to justify the cost. For a high school class, both Hobbs (personal communication, November 19, 1992) and Hanna (personal communication, November 5, 1992) agree that there should be no more than 20 students for one class in the whole system.

Kabat & Friedel (1990) found that one of the problems in distance education is that there is little attention paid to the remote site students (p. 68). They recommended the teacher could increase the participation by the remote site student by increasing the instructor travel to the remote site. Greater interactivity opportunities should be done in class. There should be a real effort to improve the turnaround time on assignments and to increase the effective use of visual aids (Kabat & Friedel, 1990, p. 68).

Conclusion

British Open University and Florida's Nova University are two excellent examples of how distance learning can work in higher education (Chang, Crombag, van der Drift, & Moonen, 1983; Mizell, 1994). Distance education can respond to the needs being presented in today's society (Ely, 1988). Distance learning has many advantages. When equity of access is required, distance education can respond. When resources need to be shared, distance education can help. When sufficient teaching personnel are unavailable, distance teaching offers extensions of existing personnel. When focus needs to be placed on the individual learner, distance education can focus. When students need reduced physical, time and scheduling constraint, distance education can be an answer (Eisenberg, 1992). There seems to be two questions remaining as to whether administrators and faculty will effectively pursue the use of technology in the school districts and postsecondary institutions. First, can the faculty and administrators overcome the qualms about technology and begin to expand their methods of instruction? Second, can the administrators handle the political issues of instituting a technologically advanced system?

References

Anderson, T. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANSUP; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Barry, J. (1994). The HyperText Markup Language (HTML) and the World-Wide Web: Raising ASCII Text to a new level of usability. Public Access Computer Systems Review, 5(5), 5-62.

Bates, A.W. (1990). Application of new technologies (including computers) in distance education: Implications for the training of distance educators. Vancouver, British Columbia: Open University Agency. (ERIC Document Reproduction Service No. ED 332 683).

Bates, T. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANPLAN; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Berners, L. (1992). World-Wide Web: The information university. Electronic Networking: Research, Applications and Policy, 2(1), 52-58.

Blomberg, R. (1989, Winter). Cost-benefit analysis of employee training: A literature review. Adult Education Quarterly, 39, 89-97.

Burge, E. J. (1990). International perspectives on distance education research. Papers presented at the preconference workshop ICDE World Conference, Caracas, Venezuela. (ERIC Reproduction Service No. 352 001)

Bretz, R. (1992). The agricultural satellite corporation: Three years of phenomenal growth. The Online Chronicle of Distance Education and Communication, 6(1), DISTED@UWAVM.BITNET.

Brey, R. (1991). US. Postsecondary Distance Learning Programs in the 1990s: a decade of growth. Washington, DC.: American Association of Community and Junior Colleges, Instructional Telecommunications Consortium. (ERIC Document Reproduction Service No. ED 340 418)

Chang, T., Crombag, H., Van der Drift, K., & Moonen, J. (1983). Distance learning: on the design of an open university. Kluwer-Nijoff: Boston.

Collins, M. (1994). Internet information management tools. Communication Education, 43(2), 112-119.

Courtois, M. P. (1994). How to find information using Internet Gophers. Online, 18(6), 18-25.

Cross, K. (1981). Adults as Learners: Increasing Participation and Facilitating Learning. San Francisco: Jossey-Bass.

Descy, D. E. (1994). World-Wide Web: Adding multimedia to cyberspace. TechTrends, 39(4), 15-16.

Eisenberg, M. B. (1992). Networking: K-12. Eric Digest. (ERIC Reproduction Service No. 354 903)

Ely, D. (1988). Trends and issues in educational technology, 1988. Syracuse, NY: ERIC Clearinghouse on Information Resources. (ERIC Document Reproduction

Service No. ED 308 859)

Eurich, N. & Schwenkmeyer, B. (1971). Great Britain's Open University: First chance, second chance, or last? New York: Academy For Educational Development.

Fraase, M. (1993). The Mac Internet Tour Guide: Cruising the Internet the easy way. Chapel Hill, NC: Ventana.

Gabbard, R. (1994). Recent literature shows accelerated growth in hypermedia tools: An annotated bibliography. Reference Services Review, 22(2), 31-40.

Goodwin, B. N. (1993). Perceptions and attitudes of faculty and students in two distance learning modes of delivery: Online computer and telecourse. Paper presented at the Symposium for the Marketing of Higher Education. (ERIC Document Services No. 371 708)

Gregor, S. D., & Cuskelly, E. F. (1994). Computer mediated communication in distance education. Journal of Computer Assisted Learning, 10(3), 168-81.

Gunawardena, C. N. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANCMC; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Hanrahan, L. (1990). Overcoming resistance to distance education. In C.C. Gibson (Ed.), Echoes from the Future: Challenges for New Learning Systems Proceedings of the Sixth Annual Conference on Distance Teaching and Learning (pp. 119-122). Madison, WI: Wisconsin University. (ERIC Document Reproduction Service No. ED 340 353)

Harrison, P., Seeman, B., Behm, R., Saba, F., Molise, G., & Williams, M. (1991). Development of a distance education assessment instrument. Educational Technology Research and Development, 39(4), 65-77.

Hesser, L. A. (1993). The use of multiple technology resources in a distance learning doctoral program. (ERIC Reproduction Service No. 372 744)

Hisle, W. L. (1990, Fall). IRC support of off-campus education. New Directions for Community Colleges, 71, 45-63.

Hobbs, V. (1990). Distance Learning in North Dakota: A cross-technology study of the schools, administrators, coordinators, instructors, and students. Denver, CO: Mid-Continent Regional Educational Laboratory.

Hobbs, V., Pellant, D. & Chastain, M. (1991). The School Administrator's Primer on

Distance Learning: Two-Way Interactive Television (I-TV via Fiber Optics. Aurora, CO: Mid-continent Regional Educational Laboratory.

Holloway, R. E. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANCMC; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Holmberg, B. (1989). The concept, basic character and development potentials of distance education. (ERIC Document Reproduction Service No. ED 329 216)

Interactive Video Programming Task Force (1992). A report to the Missouri Public Service Commission . (Report No. TO-92-92). Jefferson City, MO: The Missouri Public Service Commission.

Janipeuh, H. & Reeves, T. C. (1992). Mental modes: A research focus for interactive learning systems. Educational Technology Research and Development, 40(3), 39-53.

Jegede, O. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANCMC; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Jenkins, J. (1981). Materials for learning: how to teach adults at a distance. Routledge & Kegan Paul: London.

Kabat, E. J. & Friedel, J. (1990). The development, pilot -testing, and dissemination of a comprehensive evaluation model for assessing the effectiveness of a two-way interactive distance learning system. Final report. Eastern Iowa Community College District: Davenport, Iowa. (ERIC Document Reproduction Service NO. ED 332 690)

Kahn, R. L. (1992). Overview of a statewide academic network: SUNYNet. Technological Horizons in Education Journal, 20(4), 85-87.

Kansas State Department of Education. (1989). Kansas communication and instruction system through fiber-optic transmission. Topeka, KS: Kansas State Department of Education. (ERIC Document Reproduction Service No. ED 332 269)

Kansas State Department of Education. (1992). Interactive Television: The future is now. Topeka, KS: Kansas State Board of Education.

Keegan, D. (1990). Foundations of Distance Education (2nd ed.). London: Routledge.

Kolomeychuk, T., & Peltz, D. P. (1992, May). Assessing the effectiveness of interactive compressed video at the University of Minnesota. Educational Technology, 61-62.

Leonard W. H. (1992). A comparison of student performance following instruction by interactive videodisc versus conventional laboratory. Journal of Research in Science Teaching, 29, 93-101.

Lockwood, F. (1989). Data collection by self-recorded audio cassette tape. Research in Distance Education, 1(2), 7-8.

Loney, P. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANCMC; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Manganm, K. S. (1992, September 9). Computer networks help public schools forge new ties with higher education. Chronicle of Higher Education, A17-18.

Marek, S. (1991). Distance education: Transforming traditional learning. Satellite Communications, 15(7), 18-22.

Mason, R. (1992). Application of electronic communication 	for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANCMC; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

McKell, L. J., Hardy, J. W., & Stocks, K. D. (1992). The IBM CENET system: Continuing education for management. Technological Horizons in Education Journal, 20(4), 93-97.

Meadows, J. B. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANSUP; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Mizell, A. P. (1991). The use of telecommunications in graduate teacher training. (ERIC Reproduction Service 372 742)

Mizell, A. P. (1993). Distance education: The application of technology to education and training (APTEC). (ERIC Reproduction Service 368 343)

Mizell, A. P. (1994). Graduate education through telecommunications: The computer and you. (ERIC Reproduction Service No. 368 346.)

Mizell, A. P., & Carl, D. R. (1994). Inter-institution cooperation in distance learning. T. H. E. Journal, 21(10), 91-93.

Morgan, E. L. (1994). The World-Wide Web and Mosaic: An overview for librarians. Public Access Computer Systems Review, 5(6), 5-26.

Morgan, N. A. (1994). An introduction to Internet resources for K-12 educators. Part I: Information resources. (ERIC Document Reproduction Service No. 372 757)

Morrison, D., & Lauzon, A. C. (1992). Reflection on some technical issues of "connecting" learners in online education. Research in Distance Education, 4(3), 6-9.

Newroe, K. (1991). Telecommunication technologies to deliver assistive technology services. Washington, DC: RESNA, Association for the Advancement of Rehabilitation Technology. (ERIC Document Reproduction Service No. ED 342 180)

Noble, E. & Chen, I. (1992, June). A comparative study of learning outcomes in distance education to classroom study. Unpublished manuscript.

Norenberg, C. & Lundblad, L. (1987). Distance delivery of vocational education Technologies and planning matrixes. Minneapolis, MN: Minnesota University, Research and Development Center for Vocational Education. (ERIC Document Reproduction Service No. ED 336 866)

Perry, W. (1977). The Open University. San Francisco: Jossey-Bass.

Pohte, T. W. (1990, Fall). Telecourses: Instructional design for nontraditional students. New Directions for Community Colleges, 71, 53-61.

Rezabek, L. L. (1992). Distance education: Perspectives from all sides of the desk. Paper presented at the Annual Meeting of the Association for Educational Communications and Technology. ERIC Reproduction Service No. 346 822)

Robichaux, M. (1992, June 1). Giving college degrees for watching TV, The Wall Street Journal, B1.

Rogers, S. M. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANCMC; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Rossman, P. (1992). The emerging worldwide electronic university: Information age global higher education. Westport CT: Greenwood.

Rubin, E. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANCMC; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Russell, T. L. (1992). Television's indelible impact on distance education: What we should have learned from comparative research. Research in Distance Education, 4(4),

2-4.

Schrum, L. (1991). Distance education: a primer for administrators. Eugene, OR: Oregon School Study Council. (ERIC Document Reproduction Service No. ED 336 866)

Shane, H. G. (1989, July-August). Britain's University of the air: An interview with Lord Walter Perry of the Open University. The Futurist, 25-27.

Smith, V. (1988, December). The people's university: a 	case for partnership. Adult Education, 61, 234-238.

Star Schools for All Our Students (1991). Examining the Status of the Star Schools Program, a federal program that enables students to be linked together via satellite or cable TV hookup with teachers in different parts of the country. Hearing before the Committee on Labor and Human Resources, United States Senate. Washington, DC: US Government Printing Office.

Sumser, J. (1992). Application of electronic communication for distance education in the third world. Bangkok Project. Bangkok, Thailand. BANCMC; University of Calgary, INTERNET: ANDERSON@ACS.UCALGARY.CA

Tanzillo, K. (1992). Is compressed video conferencing ready for school. Communication News, 29(6), 47.

Taylor, T. E., Thomas, E. A., Thomas, R., Stone, J., Fry, J., & Fidler, P. (1992). Interactive remote teaching networks (A recommendation of applied technology) for Longview Community College. Senior Project, DeVry -Kansas City, MO.

Tennant, R. (1992). Internet basics. (ERIC Document Reproduction Service 348 054)

Verduin, J. & Clark, T. (1991). Distance education: The foundations of effective practice. Jossey-Bass: San Francisco.

Watkins, B. T. (1994). Uniting North Dakota: Three institutions offer complete degree programs on interactive video network. Chronicle of Higher Education, 40(49), 17-19.

Wells, R. (1992). Computer-mediated communication for distance education: An international review of design, teaching, and institutional issues. ACSDE Research Monograph Number 6. (ERIC Reproduction Service 351 997)

Wiggins, R. (1995). Publishing on the World Wide Web. New Media, 5(2), 51-55.

Barry, J. (1994). The HyperText Markup Language (HTML) and the World-Wide

Web: Raising ASCII Text to a new level of usability. Public Access Computer Systems Review, 5(5), 5-62.

Berners, L. (1992). World-Wide Web: The information university. Electronic Networking: Research, Applications and Policy, 2(1), 52-58.

Burge, E. J. (1990). International perspectives on distance education research. Papers presented at the preconference workshop ICDE World Confrence, Caracas, Venezuela. (ERIC Reproduction Service 352 001)

Collins, M. (1994). Internet information management tools. Communication Education, 43(2), 112-119.

Courtois, M. P. (1994). How to find information using Internet Gophers. Online, 18(6), 18-25.

Descy, D. E. (1994). World-Wide Web: Adding multimedia to cyberspace. TechTrends, 39(4), 15-16.

Eisenberg, M. B. (1992). Networking: K-12. Eric Digest. ERIC Reproduction Service 354 903)

Fraase, M. (1993). The Mac Internet Tour Guide: Cruising the Internet the easy way. Chapel Hill, NC; Ventana.

Gabbard, R. (1994). Recent literature shows accelerated growth in hypermedia tools: An annotated bibliography. Reference Services Review, 22(2), 31-40.

Goodwin, B. N. (1993). Perceptions and attitudes of faculty and students in two distance learning modes of delivery: Online computer and telecourse. Paper presented at the Symposium for the Marketing of Higher Education. (ERIC Document Services 371 708)

Gregor, S. D., & Cuskelly, E. F. (1994). Computer mediated communication in distance education. Journal of Computer Assisted Learning, 10(3), 168-81.

Hesser, L. A. (1993). The use of multiple technology resources in a distance learning doctoral program. ERIC Reproduction Service 372 744)

Mizzell, A. P. (1991). The use of telecommunications in graduate teacher training. (ERIC Reproduction Service 372 742)

Mizell, A. P. (1993). Distance education: The application of technology to education and training (APTEC). (ERIC Reproduction Service 368 343)

Mizell, A. P. (1994). Graduate education through telecommunications: The computer and you. ERIC Reproduction Service 368 346.

Mizell, A. P., & Carl, D. R. (1994). Inter-institution cooperation in distance learning. T. H. E. Journal, 21(10), 91-93.

Morgan, E. L. (1994). The World-Wide Web and Mosaic: An overview for librarians. Public Access Computer Systems Review, 5(6), 5-26.

Morgan, N. A. (1994). An introduction to Internet resources for K-12 educators. Part I: Information resources. (ERIC Document Reproduction Service 372 757)

Morrison, D., & Lauzon, A. C. (1992). Reflection on some technical issues of "connecting" learners in online education. Research in Distance Education, 4(3), 6-9.

Rezabek, L. L. (1992). Distance education: Perspectives from all sides of the desk. Paper presented at the Annual Meeting of the Association for Educational Communications and Technology. ERIC Reproduction Service 346 822)

Rossman, P. (1992). The emerging worldwide electronic university: Information age global higher education. Westport CT: Greenwood.

Tennant, R. (1992). Internet basics. (ERIC Document Reproduction Service 348 054)

Watkins, B. T. (1994). Uniting North Dakota: Three institutions offer complete degree programs on interactive video network. Chronicle of Higher Education, 40(49), 17-19.

Wells, R. (1992). Computer-mediated communication for distance education: An international review of design, teaching, and institutional issues. ACSDE Research Monograph Number 6. (ERIC Reproduction Service 351 997)

Wiggins, R. (1995). Publishing on the World Wide Web. New Media, 5(2), 51-55.

***

Distance Education and Computer-Mediated Instruction Bibliography

Barry, J. (1994). The HyperText Markup Language (HTML) and the World-Wide Web: Raising ASCII Text to a new level of usability. Public Access Computer Systems Review, 5(5), 5-62.

Berners, L. (1992). World-Wide Web: The information university. Electronic Networking: Research, Applications and Policy, 2(1), 52-58.

Burge, E. J. (1990). International perspectives on distance education research. Papers presented at the preconference workshop ICDE World Confrence, Caracas, Venezuela. (ERIC Reproduction Service 352 001)

Collins, M. (1994). Internet information management tools. Communication Education, 43(2), 112-119.

Courtois, M. P. (1994). How to find information using Internet Gophers. Online, 18(6), 18-25.

Descy, D. E. (1994). World-Wide Web: Adding multimedia to cyberspace. TechTrends, 39(4), 15-16.

Eisenberg, M. B. (1992). Networking: K-12. Eric Digest. ERIC Reproduction Service 354 903)

Fraase, M. (1993). The Mac Internet Tour Guide: Cruising the Internet the easy way. Chapel Hill, NC; Ventana.

Gabbard, R. (1994). Recent literature shows accelerated growth in hypermedia tools: An annotated bibliography. Reference Services Review, 22(2), 31-40.

Goodwin, B. N. (1993). Perceptions and attitudes of faculty and students in two distance learning modes of delivery: Online computer and telecourse. Paper presented at the Symposium for the Marketing of Higher Education. (ERIC Document Services 371 708)

Gregor, S. D., & Cuskelly, E. F. (1994). Computer mediated communication in distance education. Journal of Computer Assisted Learning, 10(3), 168-81.

Hesser, L. A. (1993). The use of multiple technology resources in a distance learning doctoral program. ERIC Reproduction Service 372 744)

Mizzell, A. P. (1991). The use of telecommunications in graduate teacher training. (ERIC Reproduction Service 372 742)

Mizell, A. P. (1993). Distance education: The application of technology to education and training (APTEC). (ERIC Reproduction Service 368 343)

Mizell, A. P. (1994). Graduate education through telecommunications: The computer and you. ERIC Reproduction Service 368 346.

Mizell, A. P., & Carl, D. R. (1994). Inter-institution cooperation in distance learning.

T. H. E. Journal, 21(10), 91-93.

Morgan, E. L. (1994). The World-Wide Web and Mosaic: An overview for librarians. Public Access Computer Systems Review, 5(6), 5-26.

Morgan, N. A. (1994). An introduction to Internet resources for K-12 educators. Part I: Information resources. (ERIC Document Reproduction Service 372 757)

Morrison, D., & Lauzon, A. C. (1992). Reflection on some technical issues of "connecting" learners in online education. Research in Distance Education, 4(3), 6-9.

Rezabek, L. L. (1992). Distance education: Perspectives from all sides of the desk. Paper presented at the Annual Meeting of the Association for Educational Communications and Technology. ERIC Reproduction Service 346 822)

Rossman, P. (1992). The emerging worldwide electronic university: Information age global higher education. Westport CT: Greenwood.

Tennant, R. (1992). Internet basics. (ERIC Document Reproduction Service 348 054)

Watkins, B. T. (1994). Uniting North Dakota: Three institutions offer complete degree programs on interactive video network. Chronicle of Higher Education, 40(49), 17-19.

Wells, R. (1992). Computer-mediated communication for distance education: An international review of design, teaching, and institutional issues. ACSDE Research Monograph Number 6. (ERIC Reproduction Service 351 997)

Wiggins, R. (1995). Publishing on the World Wide Web. New Media, 5(2), 51-55.